

CHAPTER 1

INTRODUCTION

Background

Since 1909 the Herring River in Wellfleet, Massachusetts has been tidally restricted by a dike (Figure 1.1 & 1.2). The original 100-meter-wide channel is blocked by a causeway (Figure 1.2), with the exception of three two-meter-wide box culverts in the middle. The southern culvert is fitted with an adjustable sluice gate, whereas the other two contain flapper gates that allow flow only in a seaward direction. The purpose of diking (Figure 1.3), and subsequent draining (Figure 1.4), of this salt marsh system was to facilitate mosquito control and to provide additional land for development. Other than the extension of Chequesset Neck Road, the construction of two dwellings and a portion of a golf course within the river valley, no other land has been developed and mosquitoes remain a problem (Soukup and Portnoy, 1986).



Figure 1.1: Satellite image of Cape Cod showing the location of the Wellfleet Harbor.

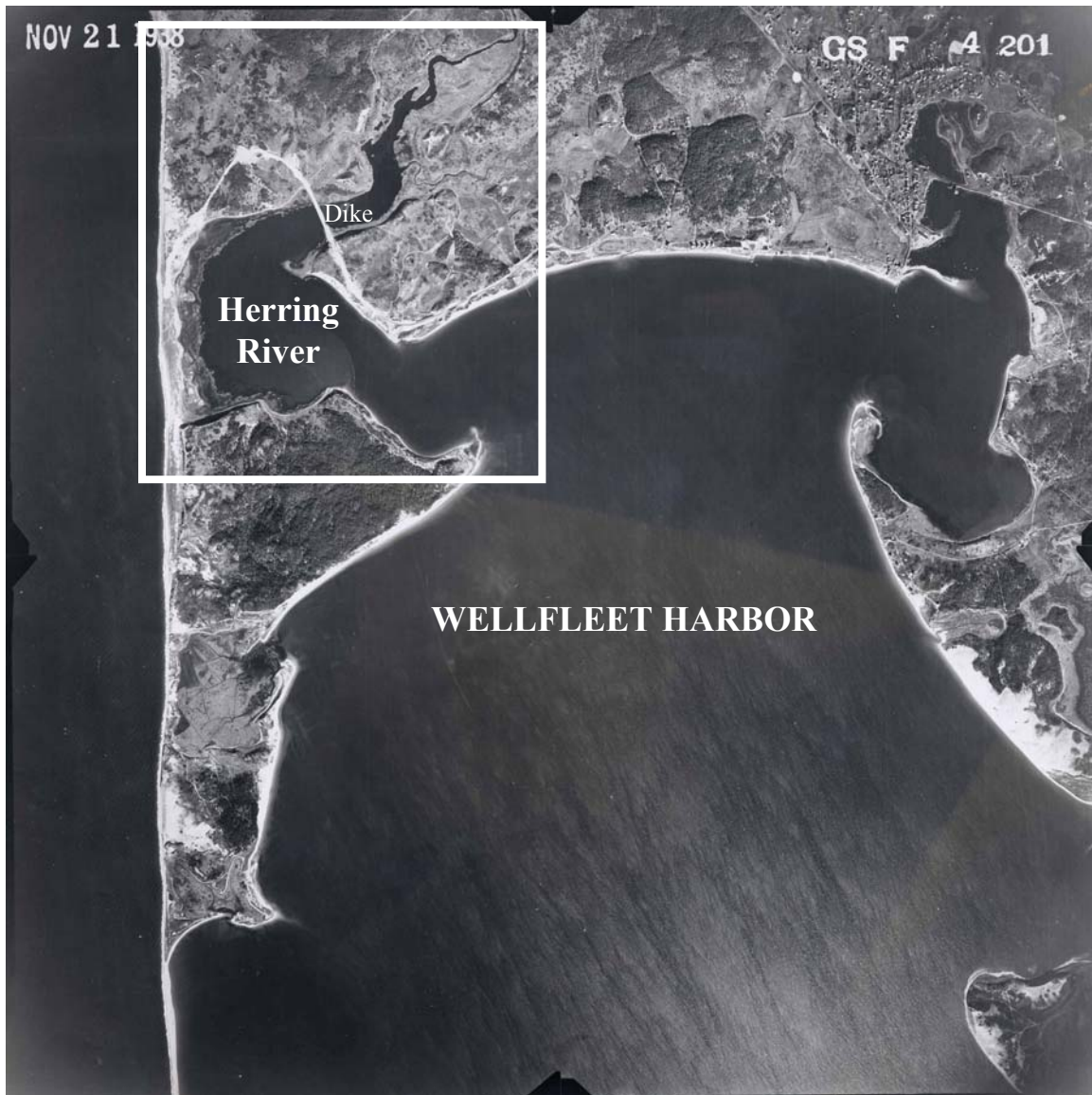


Figure 1.2: Location of Herring River with respect to the Wellfleet Harbor.

In the past the Herring River was the site of a major herring run. In addition to providing a nursery for fin and shellfish the Herring River maintained a productive 1100-acre salt marsh system, but that is not the case today. The tidal restriction on this system has resulted in major water quality problems including hypoxia, acidic waters (pH <4) and the formation of acid sulfate soils (Portnoy, 1991). Poor water quality has caused fish kills (Portnoy et al., 1987), and peat drainage has resulted in subsidence of the marsh surface of up to 80 centimeters (Portnoy 1997). With respect to coastal geology, marsh subsidence removes much of the protection that the coastal wetland normally provides in buffering high-energy storm waves. Ecologically, the freshening and drainage of the original salt marsh has allowed the invasion of exotic plants.

A series of scientific studies has been conducted by the Cape Cod National Seashore to determine ways to improve habitat quality in the vicinity of the Herring River. Results indicate that the environmental problems could be corrected by restoring tidal flow to the area above the dike (Portnoy and Reynolds, 1997). However, the proposal to increase tidal flow through the dike structure has raised concerns among local shellfishermen. To address how increased tide heights, salinity and sedimentation would be affected by restored tidal flow, hydrodynamic modeling was completed in 2001 (Spaulding and Grilli, 2001). Research has also been conducted to address the effects of flooding on the adjacent groundwater supply (Martin 2004).

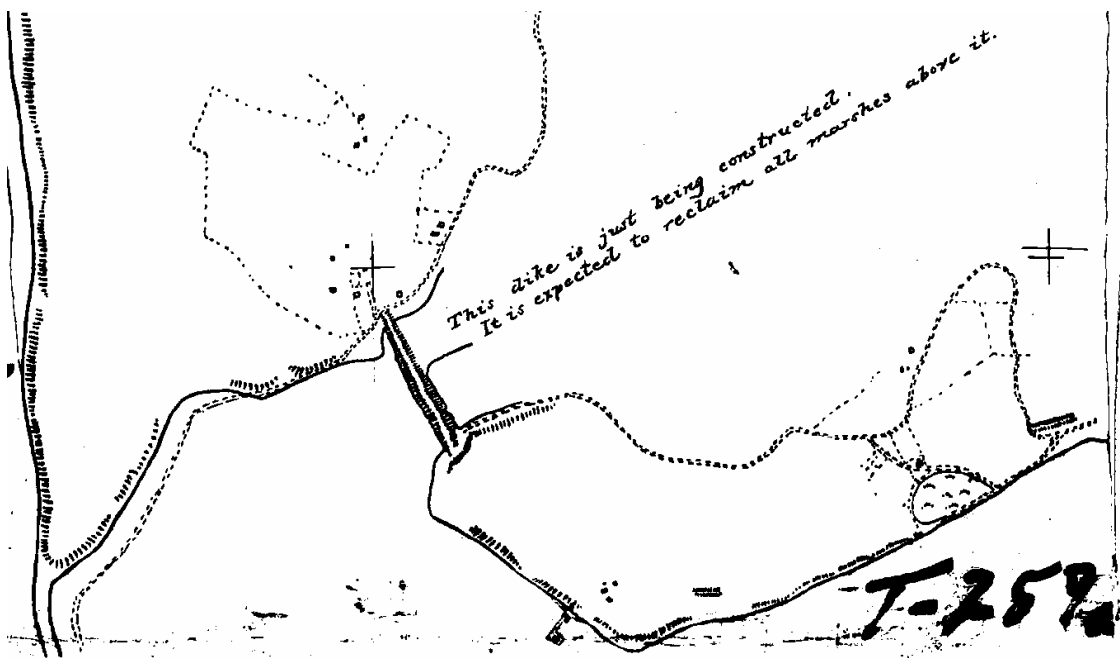


Figure 1.3: 1908 T-sheet detailing the plan to install a dike across the Herring River.

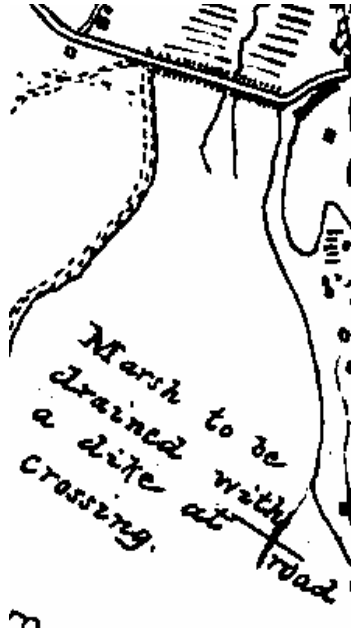


Figure 1.4: 1909 T-sheet indicating that the marsh above the Herring River Dike is to be drained.

Purpose

Town officials and resources managers are particularly interested in the issue of how changing the tidal regime in the river might affect sedimentation on shellfish beds seaward of the structure. Therefore, the purpose of this study is to address sedimentation concerns related to the possible restoration of the Herring River and to determine the effect of altering the tidal system on tidal flats used for oyster and hard clam culture in Wellfleet Harbor.

Plan/Methods

This study used a two-step approach to address sedimentation concerns associated with increasing tidal flow to the Herring River:

- 1) Solicitation of specific sedimentation questions concerning the restoration of the Herring River, with special emphasis on the effects on shellfish grants.
- 2) Response to these questions using pertinent information from previous investigations augmented with new, site specific data and analyses.

Results of Interviews

The first step, aside from background and previous studies research, was to amass a list of questions and concerns from shellfishermen with respect to sedimentation along the Herring River. A list of contact names was generated by speaking with various people in the Town of Wellfleet and Cape Cod National Seashore. Over the course of a two-week period several attempts to call every person on the list were made (Appendix A). After a standard introduction and statement of purpose for the phone call, the person was asked if he/she was willing to discuss their feelings on the issue. The following was the standard introduction:

“Hi my name is Amy Dougherty and I am a geologist working with the Association of Women Geoscientists and Cape Cod National Seashore. I am performing a study related to sedimentation concerns associated with the potential restoration of the Herring River. Would you mind sparing a moment to talk?”

Several fishermen started their response by saying that they do not have any concerns related directly to sedimentation, but then went on to pose other concerns related to the restoration project. Since these questions are outside the investigator's area of expertise, and thus outside the scope of this study, they are not directly addressed in this report. However, due to the prevalence of these lingering concerns a list was compiled of the most prominent and recurring questions. This list, along with a log of detailed notes typed after every conversation, can be found in Appendix A.

From the various conversations it became evident that two major questions pertaining to sedimentation existed:

- 1) Does opening the Herring River Dike affect the stability of The Gut?
- 2) Does opening the Herring River Dike affect sedimentation below (seaward of) the dike?

Of the shellfishermen who expressed sedimentation concerns during the interviews, every one voiced both of these questions; therefore, they are the focus of this study. The following Chapter II will discuss the relationship between the stability of The Gut and the Herring River. Chapter III will detail a study performed specifically on sedimentation below the Herring River Dike. Chapter IV summarizes the conclusions found in previous chapters.